

Non-Adherence to Type 2 Diabetes Medication

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Evidence Synthesis on Non-Adherence to Type 2 Diabetes Mellitus Medication

Introduction

Medication non-adherence among patients with Type 2 Diabetes (T2DM) has been a prevalent issue over the years that have affected treatment of the condition. As a result, the treatment and management efforts of health care providers have become less effective to a large number of type 2 diabetes patients. Health care providers can contribute to the reduction of type 2 diabetes medication non-adherence through patient education and uses of practices that improve adherence with medication treatment regimes. It is imperative to examine non-medication adherence in T2DM, causes of medical non-adherence, correlation with health outcomes, and interventions suggested by literature to improve medication adherence in a bid to ensure the efforts of health care providers are effective and well informed. This review also focuses on the barriers to medication adherence among adult patients with T2DM, self-management, and also explores the role of health providers in optimum T2DM management.

Background

The medical problem associated with medication non-adherence among patients has been contested over the years. Numerous adverse health care repercussions have been related to poor adherence to medication. A research study by Brundisini, Vanstone, Hulan, DeJean, and Giacomini (2015) shows that medication adherence among patients with Type 2 diabetes plays a pivotal role in ensuring effectiveness in treatment and well-being. Even though numerous factors are affecting the glycemic control among diabetic patients; Ryan, Fedders, Jennings, Vittoria, and Yanes (2014) argue that adherence to diabetes medication enhances control. Therefore, understanding the importance of treatment and medication is paramount to increase adherence to medication regimens.

Significance

People living with Type 2 diabetes need to understand the various aspects of the disease and the significance of taking medication. In this case, providing support and education to these individuals plays a significant role in precluding the pervasiveness and effects of the disease. A research study by Bagnasco et al. (2014) mentions the importance of self-management in controlling their diseases together with healthcare practitioners. Healthcare providers have the onus to provide treatment and medication to the sick. They have to ensure patients stick to the provided medicine to improve their health. The primary objective of healthcare institutions is to provide better quality medical services to the patients. It is, therefore, essential for the providers to instill a culture of adherence to medication among patients. One of the measures that healthcare providers can use to improve medication adherence is by educating them on the significance of medication to the patients' health outcome. It is also essential to provide resources to overcome the barriers that inhibit compliance with medication use.

Problem Statement

The medical problem associated with medication non-adherence among patients has been challenged through various approaches over the years. However, it remains to be one of the core problems in healthcare administration. Inadequate use of prescribed type 2 Diabetes medications such as antihyperglycemics is a significant deterrent to proper self-management and treatment of the condition. Giorgino et al. (2018) note that poor medication adherence contributes to inadequate glycemic control, more hospitalization, and increases the risk of diabetic complications. Mackay et al. (2013) help in understanding the scope of the issue and notes that electronic records indicate that 22% of new type 2 diabetes prescriptions are never picked or only filled once. Lack of glycemic control inhibits the treatment process and hinders the patient

from having better treatment outcomes (Shrivastava et al. 2013). The collective effect of the inadequate use of prescribed type 2 diabetes medication increase in the costs of outpatient care and morbidity and mortality among patients. This review looks into a vast range of themes directly and indirectly related to non-adherence to medication such as self-management and the role of the healthcare provider. It also explores the factors that contribute to the pervasive non-adherence rates with a particular emphasis on modifiable factors that health providers can use to address the high non-adherence to T2DM medication.

Perspectives, Incidence, and Prevalence

Historical and Societal Perspectives

Historically, medication non-adherence among ailing patients has been considered commonplace. As research studies deduce, patients who fail to adhere to medication have had poor health outcome (Giorgino et al., 2018). Since medication is part of the treatment process, patients should remember to take their prescribed medication to ensure a quick recovery. Medication adherence can be significantly improved for patients who have the support of friends and family members. There are cases where patients forget to take their medication due to some mental or psychological problem. Having someone around to take care of the patient is recommended to ensure that they remind them when to take the medication the issue of non-adherence to medication has received a lot of criticism from healthcare practitioners since it results in poor health (Giorgino et al., 2018). However, understanding the primary reasons for non-adherence would help reduce these incidences.

Medication beliefs and perceptions on a personal level or borrowed from the society are among the most prominent contributors to poor adherence to type 2 diabetes. A considerable number of patients ascribe to negative beliefs especially on the risk of medication. Bagnasco et

al. (2014) argue that patient's concern of their medication overpasses concerns of their necessity in regards to adherence. Hence, concerns on medication among people living with T2D have a substantial adverse effect on adherence and acceptance of new medications. Besides, medications beliefs can also be rooted in societal and cultural beliefs and this well-illustrated in minority groups. A study by Hu et al. (2014) provides more rationale to this fact as it shows that Latinos and African Americans had more worries concerning the quality of life effects of T2DM medications than non-Hispanic Caucasians. This underlines the fact that medication beliefs firmly held by different minority groups on side effects and costs of treatment and they affect the rates of adherence to medications. Likewise, society has always had mixed reactions towards medication and medical treatment in general. There are people in society who do not believe in medication due to personal opinions or family traditions (Bagnasco et al., 2014). To a great extent, these are modifiable facts that that can be succinctly addressed by the health provider on an individual and family level.

Incidence and Prevalence

Diabetes is a highly prevalent condition presently affecting around 382 million people globally (Brundisini et al., 2015). In the United States, around 24 million people are presently affected by the condition with forecasts suggesting a rise to 44 million people by 2034 (Kennedy-Martin, Boye, & Peng, 2017). The prevalence of Type 2 diabetes is high ranging from 85-95 percent of the entire affected people (Brundisini et al., 2015). There are various factors linked to the augmented pervasiveness of Type 2 diabetes, including environmental and behavioral factors such as age, poor dietary habits, and decreased physical activities (Bagnasco et al., 2014). With the rising T2DM patient populations, health care providers have the mandate

of ensuring patients understand the importance of treatment and medication which in turn will increase adherence to medication regimens.

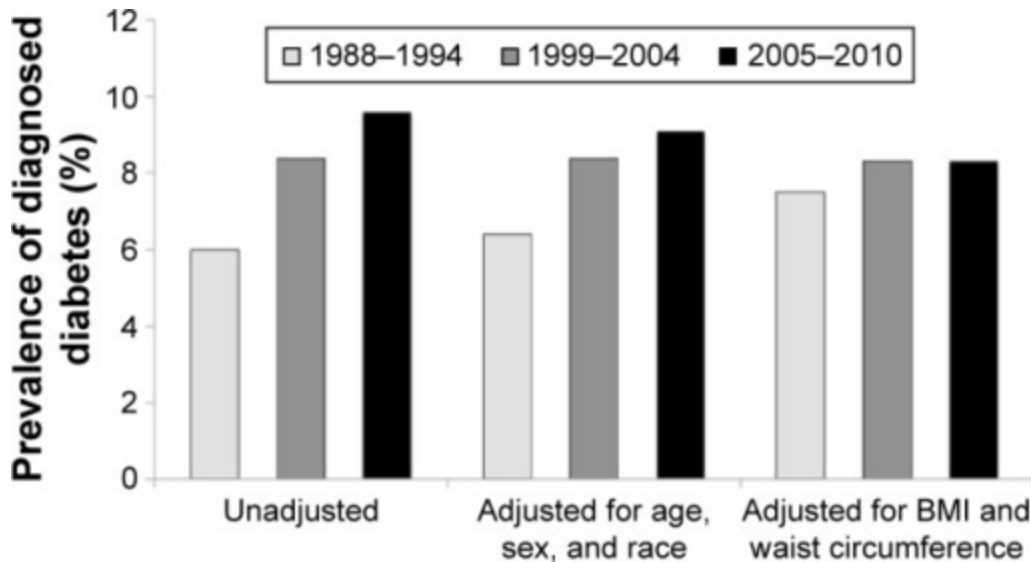


Figure 1 Prevalence of Diagnosed Diabetes (Polonsky & Henry, 2016)

Figure 1 shows the Prevalence of diagnosed diabetes among adults 20 years old from the NHANES of 1988–1994 and 1999–2010 (Polonsky & Henry, 2016). This figure indicates that diabetes affects an extensive population of individuals.

Studies report the incidence of poor medication adherence to be in a wide range of 36% to 93% for oral medications and insulin 60% (Sapkota et al., 2015). These rates are also identified by Giorgino et al. (2018) who added that the high variability is the duty to the difference in methodologies used. In a study identified by Bailey & Kodack (2011), the non-adherence to medication in a range of chronic disorders is 24.8%. However, incidences of non-adherence of diabetes are the highest at 32.5% and lowermost for human immunodeficiency viral infections at 11.7%. In the study that uses questionnaires, patient diaries, pill counts at follow up appointments, prescription filled and electronic monitoring, the incidence rate of T2DM medication non-adherence stands out. Bailey & Kodack (2011) observe that conditions perceived

to be highly life-threatening or painful are highly likely to receive better adherence. The researchers only highlight a piece of a wide variety of impediments to adherence to medication ranging from behavioral issues to environmental factors.

Health Care Costs of the Problem

With the projected increase in the number of diabetic patients, the cost burden of the problem is high and burdensome to the health care system. A study by Martin, Boye, & Peng (2017) reported that the global healthcare expenditure for adults with Diabetes Mellitus was \$673 billion in 2015. The rising costs combined with the rising patient population indicate the gravity of the problem and point at high spending. Health care costs of chronic diseases such as T2DM can be categorized as expected and unexpected costs. Expected costs encompass of expenses incurred in support of continuous outpatient care such as medication, test, and monitoring. On the other hand, the unexpected costs are those associated with hospitalization or ER visits and are closely linked to poor health outcomes on the long-term (Kennedy-Martin, Boye, & Peng, 2017).

While policies and subsidies can only modify expected outcomes, unexpected costs are modifiable and avoidable through correct medication adherence. Hence, medication adherence plays a significant role in lowering the overall costs of medication by reducing the unexpected expenses. Even though limited research highlights the future expenses of T2DM, Kennedy-Martin, Boye, & Peng, (2017) suggests that improving medication adherence will reduce costs by \$340 million in 5 years in the U.K. and have a substantial effect globally. By advocating for better medication adherence, healthcare providers not only improve health outcomes but also reduce spending thereby addressing the health care costs of the problem.

Role of APRN's Role in Solutions.

Health care providers play a critical role in addressing the prevalent issue of non-adherence to medical prescription. Even though different health care providers can help in addressing non-adherence to T2DM, Advanced Practice RN's (APRN) are at the forefront of ensuring the patients adhere to medication. APRNs are the primary point of patient interaction with the healthcare setting hence providing an excellent platform for developing relationships. Upon diagnosis and prescription, the APRN's have the responsibility of preparing the patient and ensuring the patient understands self-management and the medication regimen. Shrivastava et al. (2013) state that a clinician should be able to recognize patients exhibiting to non-adherence and focus on them. The APRN can use approaches such as motivational interviewing which helps in understanding the situation and beliefs of the patient and use this information to create a patient-centered approach where issues such as decision making are made in partnership with the patient (Bailey & Kodack, 2011). This approach helps in addressing all the potentially modifiable barriers and includes the much-required input of the patient thereby reducing the incidences of non-adherence.

Furthermore, direct contact with the patient helps the APRN to comprehend the safety concerns of the patient and address them, institute a follow-up routine that continually engages the patient in a bid to monitor for adherence and keep track of the T2DM patient's reaction to medication. Equally important during the follow-up patient-centered interventions is patient involvement in goal setting and patient education through innovative approaches such as videos on safe medication administration as well as written materials on prescriptions (Giorgino et al., 2018). This content is delivered through the educational program which aims at improving T2DM rates.

Apart from addressing modifiable treatment-related factors, APRNs can also develop interventions to reduce the treatment burden. Pill burden and dosage formulation have been identified as critical deterrents to adherence of medication. Giorgino et al. (2014) note that to improve the adherence of antihyperglycemic medication, physicians can improve the delivery systems for injectable dosages and use fixed-dose combination therapy (FDCT) instead of dual therapy for oral medications. While drawing a line between the two approaches Giorgino et al. (2014), shows that FDCT was linked to better medication adherence and glycemic control than co-administered dual oral therapy. This uptake of Evidence-Based Practices (EBP) that reduces the treatment burden also includes the use of advanced dosage systems such as the insulin pen device which can increase medication adherence in patients using injections (Andrew et al., 2010). APRNs have the mandate of implementing EBPs such as FDCT and also using contemporary means of delivery to reduce side effects thereby increasing adherence to medication.

Foundation of PICOT

As aforementioned, the incidence rates of medication non-adherence affect more than 50% of the entire type 2 diabetes mellitus population (Kennedy-Martin, Boye, & Peng, 2017). Given the health care costs of DM are incredibly high globally, this is a problem that needs to be addressed extensively through a sufficient and practical approach. Health care providers are at the forefront and offer a potent avenue of addressing the widespread problem. Patient education and support give the healthcare provider the opportunity to address issues that led to poor adherence in a more convenient and integrated approach. The research aims at identifying barriers to medication non-adherence in type 2 Diabetes mellitus adults' patients and determine

the potentially modifiable issues in literature that can be addressed through weekly educational group meetings.

P) In adult clients with type 2 diabetes; with barriers to medication adherence.

I) weekly follow up diabetes educational group meetings.

C) In comparison to clients who do not attend diabetes education.

O) Improved medication adherence and decreased A1C levels

T) Over three month's period.

In adult clients with type 2 diabetes exhibiting barriers to medication adherence (P), instituting a weekly follow up diabetes educational group meetings (I), in comparison to clients who do not attend diabetes education (C), will improve to medication adherence (O), over three months period (T).

Barriers to Medication Adherence

This study classifies obstacles to non-adherence by factors that health care providers can modify and those that are non-modifiable. The researchers note that factors such as younger age, lower educational level, and lower income are beyond the capability of the health provider (Polonsky & Henry, 2016). On the other hand, factors such as perceived treatment efficacy, hypoglycemia, treatment convenience and complexity, the cost of treatment, perceived beliefs on medication, and physician trust are potentially modifiable by the health provider and should be used to address the issue of medication non-adherence (Polonsky & Henry, 2016). These classifications of factors that contribute to medication non-adherence assist in examining the large cohort of barriers that inhibit effective management of type 2 Diabetes.

Non-Modifiable Contributing Factors

To a greater extent, Non-adherence to medication is caused by economic, access and demographic factors (Ryan et al., 2014). It has been well-documented that there is poor medication adherence among low-income individuals, the uninsured, and minorities (Hu et al., 2014). The adverse changes in the medication-taking behavior among these populations have been attributed to high costs of medicines as well as cost implications of treatment such as physician visits. Kennedy-Martin, Boye, & Peng (2017) concur with this fact and note that the cost of treatments plays a significant role in determining the adherence of the patient to medication. More critical is the out of pocket costs of medications which relegate the adherence to the socio-economic status of an individual. While SES is not easily modifiable, a study by (Ryan et al., 2014) shows that T2D patients with low-income Medicare subsidy had lower out of pocket costs and better adherence than those without subsidy. Also, the key demographic factors have been identified to be young age and lower education levels (Andrew et al., 2010). At a young age, T2D patients are highly likely to have poor adherence to medication as compared to older patients. A combination of economic, access and demographic factors present barriers that cannot be modified by the APRN in an attempt to improve medication adherence in the patient population.

Modifiable Contributing Factors to Non-Adherence to T2D Medication

Addressing the poor adherence to medication in T2D patients narrows down to factors that can be modified by the nurse in the bid to improve management and treatment of the condition (Giorgino et al. 2018). This includes the perceived treatment efficacy. In this, patients adequately use medication regimens when they understand the medication contributes positively and has a relatively immediate outcome. The self-management aspect of T2D treatment is highly

motivated when the patient realizes that improvement is occurring hence leading to better and reliable use of medication.

Further, hypoglycemia related events also affect adherence to medication. A study cited by Giorgino et al. (2018) shows that treatment that resulted in moderate to worse symptoms of hypoglycemia had poorer medical adherence as compared to that with no or mild hypoglycemia. A Hypoglycemic event institutes fear of the patient to hypoglycemia which in turn supports non-adherence to type 2 diabetes medication such as metformin that leads to the event (Polonsky & Henry, 2016). Therefore, the choice of medication and prescription dosage influences adherence rates which are also closely linked to prescription errors and lack of proper understanding of prescription dosage.

Moreover, as treatment and management become complex and burdensome on the type 2 diabetes patient, adherence to medication reduces significantly. The prescribed number of dosage per day influences adherence on the medication especially in chronic conditions such as T2DM (Polonsky & Henry, 2016). Treatment complexity and medication administration also adversely affect adherence to medication. It has also been found that the administration of medication poses a substantial hurdle to adherence as some patients are afraid of needles (Supachaipanichpong et al., 2018). In most cases, patients were reported to have a fear of incorrect administration of insulin, delivery devices such as the use of needles and the pain of the injection, as well as consequences of incorrect procedure (Andrew et al., 2010). Studies also show that patients with a comorbid medical condition have a higher chance of non-adherence (Brundisini et al., 2015). It is also common for patients taking multiple medications to forget to take a specific medication. A combination of these factors relating to convenience and

complexity lead to poor adherence to medication thereby affecting short and long-term health outcomes of the medical intervention.

The patient's trust intrinsically motivates adherence to medication in the health provider. The nature of chronic conditions such as T2D calls for consistent interactions between the patient and the health provider. Polonsky & Henry (2016) note that during these interactions, patients that feel that their concerns have been addressed have high adherence to medication. This annotation underlines the role of communication in the management of T2D and suggests that it builds the relationship between the patient and the healthcare provider. Health provider trust can help address other causative factors that affect non-adherence such out of pocket costs, medication beliefs and sufficiently contribute to improving treatment efficacy (Vos et al. 2016). The mandate of developing trust solely lies on the health provider and spans from the time of diagnosis to continuous treatment which should include enhancing medication to minimize its effect on the patient.

Educational Group Sessions

Educational group session for the T2DM patient is an intervention that can be sufficiently developed to target modifiable treatment beliefs related to the efficacy of medication, the importance of medication and side effects. Vos et al. (2016) offers a comprehensive account of educational group session interventions and notes that the patient should be encouraged to develop an action plan for adherence and the practitioner can review this in the next meeting. The session's address the guidelines for medication, how to take medication correctly, known barriers, and then the individuals are encouraged to write personal goals to improve (Vos et al., 2016). More engagement and interactions with others motivate the patient to take responsibility for the disease. Aliha et al. (2013) propose that the healthcare provider should act as guidance

and facilitator of the group session and in case the patient has questions. This exposes the patient to an extensive amount of knowledge and fosters the commitment to medication adherence.

The relationship fostered by the physician with the patient sets the right foundation for treatment and management that enables better adherence. Bailey & Kodack (2011) note that it is essential to improve communication in the relationship between the health care providers and the patient as it enhances patient education on different critical topics such as the potential side effects of medication. Communication is also highlighted by Polonsky & Henry (2016) who note that enhanced health care provider communication on the benefits and risk of medication is one of the most productive approaches to ensure the effectiveness of education programs. The rapport between the T2DM patient and the healthcare provider is enhanced via effective communication which in turn contributes immensely in making educational useful and ultimately improving adherence in T2D patients.

Follow Up

While interventions can be useful in mitigating poor adherence, the long-term effectiveness of the medication entirely lies on regular follow up by the health provider. While examining the factors that support self-management, Shrivastava et al. (2013) underline the need of regular follow up and adds that it plays an integral part in the long-term management of T2D by immensely improving long-term management. Regular follow up to ensure the effectiveness of the intervention which in this case is educational programs as they also allow the health provider to monitor the progression of the disease and avert any long-term implications (Eik Filho et al., 2016). Regular follow up is not only useful in monitoring the condition and facilitating the intervention but also creating the appropriate avenue for effective communication, building trust and developing a relationship with the patient and addressing common

misconceptions of the condition (Giorgino et al. 2018). Essentially, regular follow up can be used to perform more functionalities than the assigned intervention which in this case is educational group meetings.

Measure of Improvement

Measuring improvement in non-adherence to medication can be done through self-reporting and measurement of glycemic control through A1C levels. Bailey & Kodack (2011) explains that adherence is derived from the days of medication collected divided by the medication prescribed and notes that by this measure patients are achieving more than 80% have an acceptable measure of adherence. Hence through self-reporting adherence below 80% of the aforementioned measure is regarded as poor adherence or inadequate use of medication. Eik Filho et al. (2016) note that the health provider should help the patient set a personal A1C level target and work towards attaining it. Even though the standard A1C level is 7, the healthcare provider should coordinate with the patient to set A1C targets attainable by the patient. These targets can supplement the educational program and also motivate patients to adhere to medication.

Conclusion

Non-adherence to T2D medication hinders a substantial patient population that is speculated to rise. The factors that contribute to poor adherence can be classified as modifiable and non-modifiable. Focusing on modifiable factors, the review identifies the treatment burden and treatment-related factors to be the most potent categorizations. The study realizes that it is the role of the physicians to use EBP to mitigate the non-adherence issues arising from the treatment burden. On the other hand, the review supports the use of educational programs to address treatment-related beliefs. However, studies also converge on the fact that effective

programs have to be multifaceted but still maintain a target modifiable factor. Further, insights on regular follow up indicate that it can be used to facilitate the effectiveness of the educational material while also allowing the physician to build a working relationship with the patient. Adherence to medication is complicated due to the multi-dimensions of T2D management, however, addressing the problem through a coordinated and targeted approach can lead to a sustained reduced incidence of non-adherence in the type 2 diabetes patient population. .

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Vos, R. C., Eikelenboom, N. W., Klomp, M., Stellato, R. K., & Rutten, G. E. (2016). Diabetes self-management education after pre-selection of patients: design of a randomised controlled trial. *Diabetology & metabolic syndrome*, 8(1), 82.

APPENDIX A

Matrix Table

Type 2 diabetes patients’ and provider’s differing perspectives on medication non-adherence

Source Citation	Purpose/Problem	Design/Sample	Instrument/ Measures [Include Reliability/Validity]	Results [Include actual data]	Strengths/Weaknesses
<p><i>Francesca Brundisini, Meredith Vanstone, Danielle Hulan, Deirdre DeJean and Mita Giacomini. (2015). Diabetes barriers to medication compliance. BMC Health Services Research (2015) 15:516 DOI 10.1186/s12913-015-1174-8</i></p>	<p>Poor adherence to medication regimens increases adverse outcomes for patients with type 2 diabetes. Improving medication adherence is a growing priority for clinicians and health care systems. We examine the differences between patient and provider understandings of</p>	<p>Systematically for empirical qualitative studies on the topic of barriers to medication adherence among Type 2 diabetes patients published between 2002–2013; 86 empirical qualitative studies qualified for inclusion.</p>	<p>86 previous studies involved 2797 individuals with Type 2 diabetes, 40 caregivers, and 356 clinicians.</p> <p>The integrative analysis of these studies provides rich findings concerning how patients and providers perceive barriers to medication adherence.</p> <p>New study organizes these findings into 7 categories of barriers and facilitators: (1) emotional experiences as positive and negative motivators to adherence, (2) intentional non-compliance, (3) patient-provider relationship and</p>	<p>This study highlights key discrepancies between patients’ and providers’ understandings of barriers to medication adherence. These misunderstandings span the many cultural and care contexts represented by 86 qualitative studies. Counseling and interventions aimed at improving</p>	<p>Strengths: Taking a patient-centered approach to medication self-management may encourage increased understanding the priorities and experiences patients, encouraging providers to identify the multiple underlying factors that promote or inhibit medication adherence in their patients creating the opportunity for patients to voice their questions or concerns about their medication regimens</p>

	barriers to medication adherence for type 2 diabetes patients.	Following qualitative meta-synthesis methods, we coded and analyzed thematically the findings from studies, integrating and comparing findings across studies to yield a synthetic interpretation and new insights from this body of research.	communication, (4) information and knowledge, (5) medication administration, (6) social and cultural beliefs, and (7) financial issues. For each, was describe how patients and providers understand the barriers, and highlight key areas of congruent vs. divergent understandings.	medication adherence among Type 2 diabetes might become more effective through better integration of the patient’s perspective and values concerning adherence difficulties and solutions.	Weakness: Recent studies corroborate our results reinforcing the sense of saturation of our data [125–128, 131], however, because studies on patient, not provider, perspectives continue to dominate we highlight providers as an important population for future qualitative investigation and possibly multi-methodology research syntheses.
An education intervention for medication adherence in uncontrolled diabetes in Thailand	Purpose/Problem	Design/Sample	Instruments/Measures [Include Reliability/Validity]	Results [Include actual data]	Strengths/Weaknesses
Source Citation					
Pratoom Supachaipanichpong, Paranee, Vatanasomboon, Supreya Tansakul, Phisan Chumchuen, (2018). An	Medication adherence is crucial to achieve diabetic control.	Quasi experimental two-group pre-/post-test	Interview questionnaire and laboratory test of HbA1c values	Result of this study designed MEI, improvement of	Strengths: Study provides evidence that the integrated MEI can improve knowledge of

<p>Education intervention for medication adherence in uncontrolled diabetes in Thailand. <i>Pacific Rim Int J Nurs Res</i> 2018; 22(2) 144-155</p>		<p>design aimed to evaluate the effects of a medication education intervention integrated in routine services of a diabetes clinic.</p>		<p>knowledge and medication beliefs of the participants were a combined effect of medication related information and education received from both physicians and nurses. The findings emphasize the importance of providing specific and needed information, and counseling. Additionally, the findings also support the concept that quality and effective communication of health care providers (both physicians and nurses) can</p>	<p>medication use, medication beliefs and medication adherence as well as glycemic control among patients with uncontrolled diabetes. This intervention, as a supplement to patient education, implies potential benefit for supporting diabetic care quality in the routine services of a diabetes clinic Weaknesses: Study specifically focused on changing medication-taking behavior, and the baseline data revealed evidence that most of the participants performed improper dietary and exercise behaviors and their HbA1c values were nearly 10% on average. Therefore, our intervention might not</p>
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				enhance a person’s understandings of medication and motivation to adhere to that medication.2	be intensive enough to lower HbA1c values as recommended within a 3 months period. Short duration that might not imply persistence of the behavior and effective glycemic control.
<p>Clinical Outcomes and Incremental costs from a medication adherence pilot Intervention targeting low-income patients with diabetes at risk of cost-related medication nonadherence</p> <p>Source Citation</p>	Purpose/Problem	Design/Sample	Instruments/Measures [Include Reliability/Validity]	Results [Include actual data]	Strengths/Weaknesses
John G. Ryan, DrPH; Mark Fedders, MSW; Terri Jennings, PhD2; Isabel Vittoria, LMHC; and Melissa	The purpose of these analyses was to understand the clinical impact	Cross-sectional, descriptive study used secondary data	ANOVAs and t tests were used to examine differences in medication adherence by age, race, ethnicity, sex, depression	Our evaluation of this pilot project suggests that offering	Strengths: Used as one component in a multifactorial intervention that

<p>Yanes, MSW. (2014). Clinical outcomes and incremental costs from a medication adherence pilot intervention targeting low income patients with diabetes at risk of cost related medication nonadherence. <i>Clinical therapeutics/volume 36, number 12</i></p>	<p>and cost considerations of a prescription assistance program targeting low-income, minority patients with diabetes and at high risk for cost-related medication nonadherence.</p>	<p>from a temporary clinical program that offered prescription medications to patients without requiring a copayment, supplemented by clinical data for those patients who filled a prescription for any class of diabetes medication. Descriptive statistics were generated for all continuous variables, including age, baseline and follow-up HbA1c levels</p>	<p>diagnosis, number of medication classes used, type of medications used, CCI, and number of chronic conditions. Pearson correlation coefficients were used to explore relationships between adherence, utilization, and CCI. ANOVA was used to compare categories of patients based on categories of medications used, demographic characteristics, CCI, adherence, clinical values, and HbA1c changes. PDC was dichotomized to create groups that were medication adherent or MNA by using the conventional 0.80 criteria. To examine differences between medication-adherent and MNA groups by age, race, ethnicity, sex, depression diagnosis, number of medication classes used, CCI, and number of chronic conditions, χ^2 and t tests were used for analysis.</p>	<p>prescriptions for diabetes medications without requiring a copayment supports medication adherence but that it is insufficient without a behavioral component. Including a behavioral component may also mitigate the potential for undermining self-management as a consequences of offering financial motivation. Eliminating copayments for generic diabetes medications within a multifactorial intervention that is</p>	<p>includes behavior change and psychosocial components that are tailored to specific patients based on demographic characteristics and comorbidity, a prescription assistance program may contribute to important reductions in HbA1c levels</p> <p>Weaknesses: Additional research is needed to acquire a more determinative cost perspective regarding a scaled-up approach to providing antidiabetes medications to patients managed in this regional public hospital system, commercial health insurance</p>
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				<p>framed by a validated behavior change theory (eg, self-determination theory) may be a relatively inexpensive initiative for lessening upstream costs from medication nonadherence among a patient segment that is known to have high risks for poor diabetes outcomes and that is likely to incur significant unreimbursed expense, with the caveat that intervention costs do not exceed estimated health care savings.</p>	<p>programs have demonstrated the value of interventions that reduce cost-related medication adherence</p>
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<p>Factors influencing self-management in patients with type 2 diabetes: a quantitative systematic review protocol.</p> <p>Source Citation</p>	<p>Purpose/Problem</p>	<p>Design/Sample</p>	<p>Instruments/Measures[Include Reliability/Validity]</p>	<p>Results [Include actual data]</p>	<p>Strengths/Weaknesses</p>
<p>Bagnasco A., Di Giacomo P., Da Rin Delllaora R., Catania G., Turci C., Rocco G. & Sasso L. (2014). Factors influencing self-management in patients with type 2 diabetes: a quantitative systematic review protocol. <i>Journal of Advanced Nursing</i> 70(1), 187-200. doi: 10.1111/jan.12178</p>	<p>The purpose of this review was to answer the following question: ‘Do personal characteristics influence the effectiveness of self-management education?’</p>	<p>Quantitative systematic review protocol. Eligible studies will be randomized controlled trials (RCTs), controlled trials and cohort studies. However, case series, case reports, cross-sectional studies, case–control studies and qualitative</p>	<p>The protocol for the systematic review was conducted according to the guidelines of the Centre for Reviews and Dissemination, York (UK) Research question includes the ‘PICOS’ components: participants, interventions, comparisons, outcomes and study design. ‘PICOS’ review questions: 1-Population Patients with type 2 diabetes. 2- Intervention Diabetes self-management education 3- Comparison None. 4- Outcome Diabetes self-management behaviors HbA1C personal characteristics influencing self-management</p>	<p>Self-management education enables patients to manage their condition successfully and it is associated with better self-care, good control over lifestyle and leading the best possible quality of life, notwithstanding the presence of a chronic disease. Type II Diabetes is a chronic disease that requires lifestyle adjustments and</p>	<p>Strengths: The personal characteristics influencing selfmanagement that result from the review could be included in the nurses’ initial assessment of a person suffering from type 2 diabetes to gain a better understanding of the person and therefore develop a more appropriate nurse–person relationship, identify and define the educational needs, adopt appropriate strategies and adjust the educational</p>

		<p>studies will be excluded.</p>	<p>education effectiveness 5- Study RCT, Ct, cohort studies</p>	<p>disease management to keep glycaemia and long-term complications under control. Education has to be customized and based on an assessment that includes factors influencing self-management, such as personal characteristics that can optimize the educational intervention</p>	<p>interventions/ programs. Weaknesses: In PICOS, the exact identification of the problem required us to consider personal characteristics either as exposure or as elements of the educational intervention, or as outcomes in terms of influence on the effectiveness of self-management education, as this choice would have then influenced the design of the studies, the inclusion/exclusion criteria and the search terms</p>
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<p>Estimating the effect of medication adherence on health outcomes among patients with type 2 diabetes</p> <p>Source Citation</p>	<p>Purpose/Problem</p>	<p>Design/Sample</p>	<p>Instruments/Measures [Include Reliability/Validity]</p>	<p>Results [Include actual data]</p>	<p>Strengths/Weaknesses</p>
<p>Andrew P. Yu, PhD, Yanni F. Yu, MA, MS, Michael B. Nichol, PhD. (2010). Estimating the effect of medication adherence on health outcomes among patients with type 2 diabetes. <i>Value in health. Volume 13. Number 8.</i></p>	<p>Applied marginal structural models (MSMs) to estimate the effects of medication adherence with hypoglycemics on reducing the risk of microvascular complications in type 2 diabetic patients</p>	<p>An application of marginal structural models</p>	<p>Patient baseline characteristics and their initial hypoglycemic regimens are described with mean and standard deviation for continuous variables and number and percentage for categorical variables. The Wilcoxon test is reported for comparing continuous variables, and the chi square test for categorical variables.</p>	<p>Unlike conventional models, MSMs estimated that higher medication adherence may result in reduced risk of microvascular complications among patients with type 2 diabetes We repeated the analysis for all specified modeling strategies (model 1–5) by various MPR thresholds using 10% point increments from 40% to 90%. The</p>	<p>Strengths: Comparing all estimates using different methods, only the adherence effect estimated by MSMs indicates a beneficial effect of adherence on outcomes, whereas all other estimates indicate that improved adherence is associated with increased risk of developing microvascular complications.</p> <p>Weaknesses: In addition to traditional risk factors of CRN, compliance with annual recommendations for diabetes and healthy</p>

				<p>results of the estimated HRs of adherence (not reported here) reveal that the benefit of adherence estimated by MSMs is stable across different adherence cutoff points, with the effects more pronounced at smaller threshold values (e.g., 40% and 50%).</p>	<p>lifestyle were associated with lower CRN. Policies and social supports that address these contextual factors may help improve CRN</p>
<p>Hu, D., Juarez, D. T., Yeboah, M., & Castillo, T. P. (2014). Interventions to Increase Medication Adherence in African-American and Latino Populations: A Literature Review. <i>Hawai'i Journal of Medicine & Public Health</i>, 73(1), 11–18.</p>	<p>The aims of this study is to investigate the effectiveness of interventions to improve medication adherence in ethnic minority populations.</p>	<p>The studies in this review were conducted with patients of mainly African-American and Latino descent with the Sample population</p>	<p>A literature search from January 2000 to August 2012 was conducted through PubMed/Medline, Web of Science, The Cochrane Library, and Google Scholar. Search terms used included: medication (MeSH), adherence, medication adherence (MeSH), compliance (MeSH), persistence, race, ethnicity, ethnic groups (MeSH), minority, African-</p>	<p>Interventions which did not involve human contact with patients were ineffective. Medication adherence represents one of the barriers minority groups</p>	<p>Strengths: The studies included in this review varied widely in many aspects, including the types of interventions used, the ethnicities and conditions of the sample populations, the methods used to measure adherence, and types of analyses</p>

		sizes ranged from 10 to 520.	American, Hispanic, Latino, Asian, Pacific Islander, and intervention	face in achieving optimal health care;	performed with their results. Weakness: However, this study only considered published literature written in English and conducted in the United States
<u>Mackey, K., Parchman, M. L., Leykum, L. K., Lanham, H. J., Noël, P. H., & Zeber, J. E. (2012). Impact of the Chronic Care Model on medication adherence when patients perceive cost as a barrier. <i>Primary care diabetes, 6(2)</i>, 137-142.</u>	It is a cross-sectional analysis that studies how beliefs on chronic illness care affect the relationship between adherence and the cost of treatment.	The researchers investigate 40 small community-based primary care practices.	the 4-item Morisky Scale was used for Medication adherence 20-item Patient Assessment of Chronic Illness Care (PACIC) was used for CCM experiences	In all the respondents, 25% cited intrapersonal adherence barriers, while 23% restricted medication due of cost.	Strength: uses a large sample of diabetic patients' hence increasing reliability. Weakness: Relies on self-reporting and is confined by the nature of cross-sectional studies. Also, the relationship between cost and adherence can be affected by unmeasured factors.

<p>Vos, R. C., Eikelenboom, N. W., Klomp, M., Stellato, R. K., & Rutten, G. E. (2016). Diabetes self-management education after pre-selection of patients: design of a randomised controlled trial. <i>Diabetology & metabolic syndrome</i>, 8(1), 82</p>	<p>The study was aimed to examining the impact of the educational program BGI on self-management behavior group of patients with type 2 diabetes up to 5 years.</p>	<p>Randomized control trial where the self-management screening tool (SeMaS) was used.</p>	<p>The main result is alteration in Body Mass Index after 2.5 years follow-up. Intention-to-treat analysis is used to differentiate between groups.</p>	<p>By differentiating between patients who will and those who are likely not to benefit from the educational program, a more (cost-) effective self-management program might be designed, also on the long-run.</p>	<p>Strengths: the study examines a wide variety of programs designed for cost effectiveness and addressing the associated factors. The research also addresses the cost-benefit analysis of educational programs. Weakness: more research should focus on defining how to measure the effectiveness of educational programs</p>
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<p>Eik Filho, W., Bonjorno, L. P., Franco, A. J. M., dos Santos, M. L. A., de Souza, E. M., & Marcon, S. S. (2016). Evaluation, intervention, and follow-up of patients with diabetes in a primary health care setting in Brazil: the importance of a specialized mobile consultancy. <i>Diabetology & Metabolic Syndrome</i>, 8, 56. http://doi.org/10.1186/s13098-016-0173-1</p>	<p>To assess the impact of a telephonic DM consultancy on patients with type 2 diabetes at a major health care network in Brazil.</p>	<p>Randomized clinical trial with 52 T2DM patients getting care at a primary health care setting.</p>	<p>6 months intervention with five follow-up meetings with an endocrinologist Had assessment and association tests for statistical analysis.</p>	<p>The management of T2DM improved as monitoring allowed the clinicians to monitor the progress of the disease. .</p>	<p>Strengths: the study incorporates the effect of educational programs on values of BMI and the waist Circumference. Weakness: The number of respondents was low compared to the entire population they are representing.</p>
<p>Aliha, J. M., Asgari, M., Khayeri, F., Ramazani, M., Farajzadegan, Z., & Javaheri, J. (2013). Group Education and Nurse-Telephone Follow-Up Effects on Blood Glucose Control and Adherence to Treatment in Type 2 Diabetes Patients. <i>International Journal of Preventive Medicine</i>, 4(7), 797–802.</p>	<p>The study aimed at examining self-care group education and nurse- telephone follow-up on glycemic control and compliance with treatment.</p>	<p>Randomized control groups with 62 patients with Type 2 Diabetes</p>	<p>The case group received Self-care group education ($n = 31$) with mobile call follow up after 12 weeks The control group ($n = 31$) received the conventional management.</p>	<p>Improved glycemic control was significant in the case group.</p>	<p>Strengths: This study uses a follow up telephone call for a period of 12 weeks hence enabling better understanding on the use of technological approaches in follow up Weakness: the duration for follow may be minimal for any appropriate change. The sample</p>

					size is also small compared to other research within the same domain.
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